

XX APPENDIX A

- Overhead Grade Separation Data Sheet
- Overhead Submittal Checklist

UNION PACIFIC RAILROAD COMPANY

OVERHEAD GRADE SEPARATION DATA SHEET

1. Location: _____
City County State

2. Milepost to centerline of Bridge: _____

3. Description of project: _____

4. Utilities on Railroad Property:

<u>Name</u>	<u>Any Adjustments Required?</u>	<u>Contact Person</u>
-------------	--------------------------------------	-----------------------

5. List all the at-grade crossings that will be eliminated by the construction of this grade separation.

6. Minimum horizontal clearance from centerline of the nearest track to face of Pier:

A. Proposed: _____ B. Existing (if applicable): _____

7. Minimum vertical clearance above top of high rail:

A. Proposed: _____ B. Existing (if applicable): _____

8. List piers where crash walls are provided:

Pier:

Distance from centerline of track:

9. Describe how drainage from approach roadway is handled: _____

10. Describe how drainage from bridge is handled: _____

11. List piers where shoring is required to protect track: _____

12. Scheduled Letting Date: _____

**ALL INFORMATION ON THIS DATA SHEET TO BE FURNISHED BY THE SUBMITTING
AGENCY TO THE MANAGER OF INDUSTRY AND PUBLIC PROJECTS**

OVERHEAD SUBMITTAL CHECKLIST

PROJECT INFORMATION:

HWY / STREET NAME:
CITY AND STATE:
COUNTY / PARISH:
PROJECT NO.
DATE:

FILE:
GRADE SEPARATION:

STATE: **LOCATION:**
STREET/HWY:
RTE: **M.P.:** **SUB.:**
DOT No.:
AWO:

Item	Required Information	Min. Req'd	As Submitted	Railroad Remarks	
				A/R	A=APPROVED R=REJECTED
Abutment or Bent #					
1	Horizontal Clearance (Left) (CL to face)	18'-0"			
2	Horizontal clearance (Right) (CL to face)	18'-0"			
3	Vertical clearance (from Top of Rail)	23'-0"			
4	Horizontal clearance to footing from CL	26'-0"			
5	Depth top of footing below base of rail	6'-0"			
6	Pier Protection wall required for < 25'	26'-0"			
7	Shoring required (CL to nearest Pt.)	12'-0"			
Bent #					
1	Horizontal Clearance (Left) (CL to face)	18'-0"			
2	Horizontal clearance (Right) (CL to face)	18'-0"			
3	Vertical clearance (from Top of Rail)	23'-0"			
4	Horizontal clearance to footing from CL	26'-0"			
5	Depth top of footing below base of rail	6'-0"			
6	Pier protection wall required for < 25'	26'-0"			
7	Shoring required (CL to nearest point)	12'-0"			
Bent #					
1	Horizontal Clearance (Left) (CL to face)	18'-0"			
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OVERHEAD SUBMITTAL CHECKLIST

Item	Required Information	Min. Req'd	As Submitted	Railroad Remarks	
				A/R	A=APPROVED R=REJECTED
Track Requirements					
1	Existing track centers	Required			
2	Track spreading taken into consideration	Required			
3	Future track centers	20'-0"			
Safety Requirements					
1	Splashboards or barrier rail Near Side(NS)	5'-0"/3'-6"			
2	Splashboards Far Side (FS)	5'-0"/3'-6"			
3	Splashboards limits adequate	R/W to R/W			
4	Fence (w/pedestian walkway)(NS or FS)	8'-0" or 10'-0"			
5	Fence (w/o pedestian walkway)(NS or FS)	10'-0"			
6	Fence limits adequate	R/W to R/W			
Drainage Requirements					
1	Adequate drainage (Left)	Required			
2	Adequate drainage (Right)	Required			
3	Drain from str. / Leaders at Bents				
General Requirements					
1	Access road (25' from CL to face)	25'-0"			
2	RR R/W shown correctly	Required			
3	ALL tracks labeled correctly	Required			
4	Existing utilities areal or underground	Required			
5	Maximum gap between structures	2'-0"			
6	Lights required for width of str. over 80'	80'-0"			
7	Track profile for 1000' on each side of str.	1000'			
8	Demolition required				
9	Abutment slope protection	> 2:1			
10	Temp. construction vertical clearance	21'-0"			
11	Temp. construction horizontal clearance	12'-0"			
12	Milepost number & direction of increase	Required			
13					
14					
15					
16					
17					
18					

INSTRUCTIONS:

Milepost and direction of Milepost must be shown in the plans. Left and Right is the orientation of structure elements facing in the direction of increasing milepost.

FILL ALL APPLICABLE PARTS OF TABLE ABOVE: In Column "As Submitted" INSERT ALL APPLICABLE VALUES FROM PLANS.

For any exception to the minimum requirements on the checklist, a detailed explanation/reason why the minimum requirements cannot be provided.

PRELIMINARY PLAN REVIEW:

IF ITEMS ON ABOVE TABLE SHOW DEFICIENCIES, ACCEPTANCE OF PRELIMINARY PLANS WILL NOT BE GRANTED UNTIL DEFICIENCIES ARE RESOLVED

FINAL PLAN REVIEW:

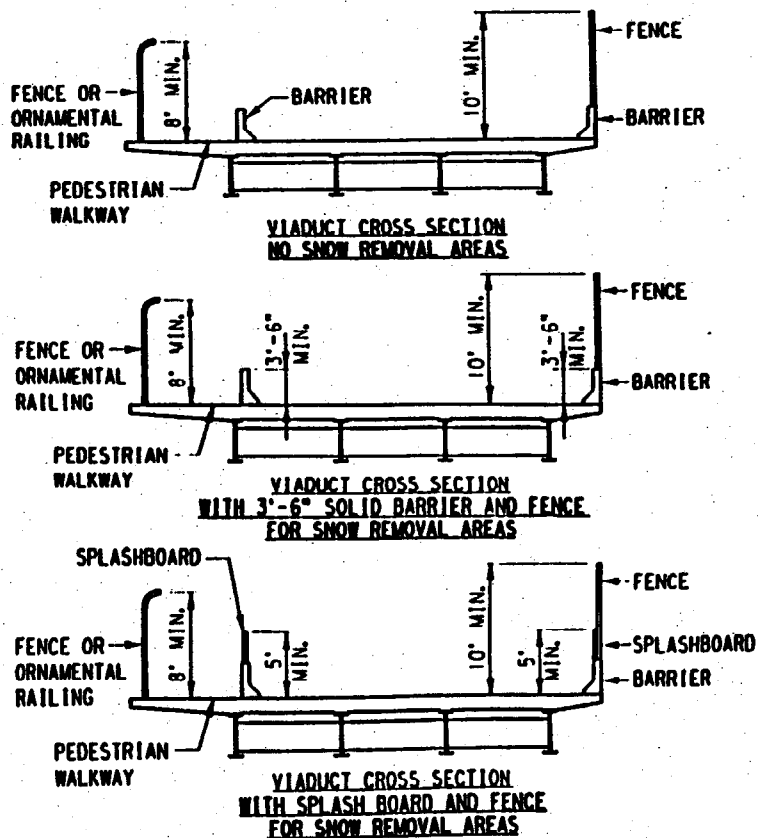
PRIOR TO STRUCTURE CONSTRUCTION SIGNED FINAL PLANS, SPECIAL PROVISIONS, AND HYDRAULIC CALCULATIONS IF REQUIRED S SUBMITTED FOR FINAL REVIEW. IF ALL ITEMS ARE RESOLVED AND PLANS COMPLY, WILL RELEASE STRUCTURE FOR CONSTRUCTION

UNITS:

UNITS FOR THE ABOVE CHECKLIST TO BE IN ENGLISH.

XXI APPENDIX B

ITEM	DRAWING
• Barrier and Clearances to Be Provided at Highway, Street, and Pedestrian Overpasses	0035
• General Shoring Requirements	106613
• Splashboards and Barrier Railing Details	UP - OH1
• Abutment Slopes and Minimum Drainage Ditches	UP - OH2



GENERAL

Fence shall be provided as indicated on the cross sections and elevation view on both sides of the viaduct in ALL new or modified structures.

Splashboards or solid 3'-6" high barrier rail shall be provided as indicated on the cross sections and elevation view on both sides of the viaduct in ALL new or modified structures where snow removal is being performed.

Lights are to be installed on the underside of the viaduct where shadows cast by the structure would interfere with Railroad operations.

Slope paving shall be provided where end slopes equal to or exceed 2 horizontal to 1 vertical.

Falsework for construction of overhead structures shall comply to UPRR guidelines.

Demolition of existing overhead structures shall comply to UPRR guidelines.

Temporary shoring shall be designed in accordance with UPRR's Shoring Requirements (Drawing No. 106613) and UPRR guidelines.

Applicant shall be responsible for identification, location, and protection of existing utilities.

Contact UPRR's "Call Before You Dig" at least 48 hours prior to commencing work at 1-800-336-9193 to determine location of fiber optics.

Exceptions to these standards must be approved by UPRR's Chief Engineer Design.

CLEARANCES

Minimum vertical clearance shall be 23 feet above the plane of top-of-rails. Additional clearance may be required for construction purposes or if sag of vertical curve must be adjusted or if future track raise for flood considerations or maintenance is probable.

Minimum horizontal clearances, measured at right angle from centerline of track, shall be as shown in elevation view.

Minimum construction clearances shall be 21 feet vertical above the plane of top-of-rails and 12 feet horizontal at right angle from centerline of track.

FUTURE TRACKS

Space is to be provided for one or more future tracks as required for long range planning or other operating requirements. Where provision is made for more than two tracks, space is to be provided for access road on both sides of tracks.

PIERS

Pier protection walls shall be provided in accordance with AREA Chapter 8, Part 2.1.5 for piers within 25 feet of the centerline of track.

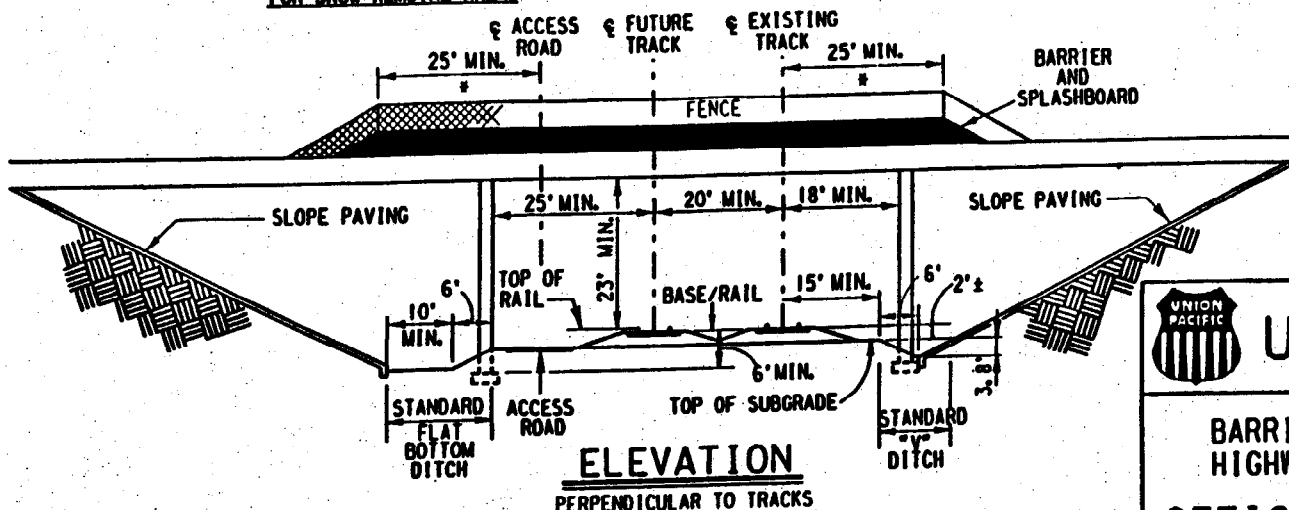
Top of footings within 25' from centerline of track shall be a minimum of 6 feet below base of rail and a minimum of 1 foot below flow line of ditch.

DRAINAGE

Drainage from the overpass shall be diverted away from UPRR's tracks and not discharged onto the tracks or roadbed.

A standard "V"-shaped or flat-bottom ditch shall be provided on each side of the tracks as necessary.

Culverts may be installed on opposite side of column from track in lieu of standard Railroad ditches when approved by Chief Engineer Design. Maintenance of culverts is to be at applicant's expense.



* Fences, splashboards, or solid barriers if required shall extend 25ft. beyond centerline of outer most track or access roadway.



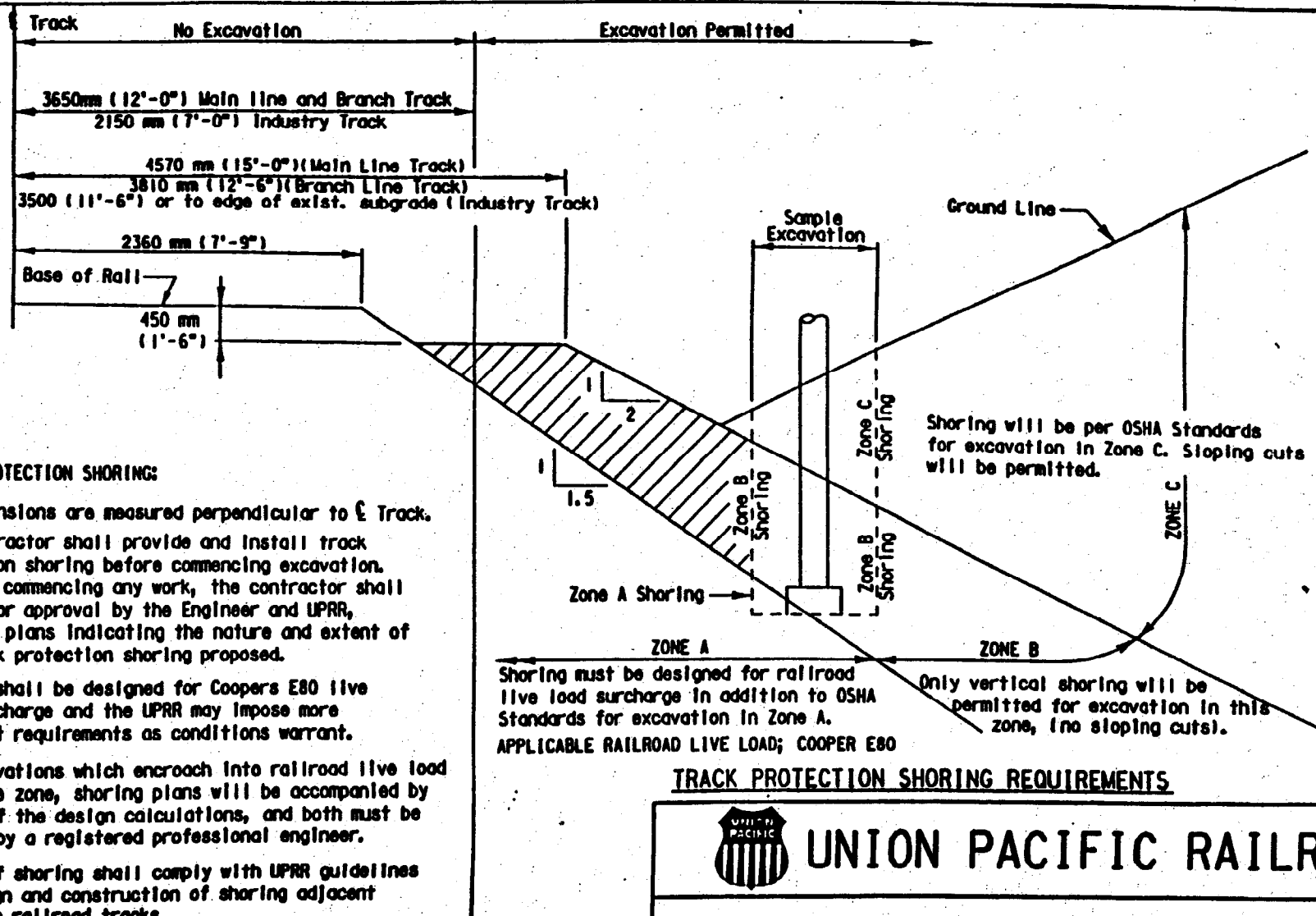
UNION PACIFIC RAILROAD

BARRIERS AND CLEARANCES TO BE PROVIDED AT
HIGHWAY, STREET, AND PEDESTRIAN OVERPASSES

OFFICE OF CHIEF ENGINEER DESIGN

REVISED: MAR. 31, 1998

STD. DWG. 0035



TRACK PROTECTION SHORING:

All dimensions are measured perpendicular to \perp Track. The contractor shall provide and install track protection shoring before commencing excavation. Prior to commencing any work, the contractor shall submit for approval by the Engineer and UPRR, detailed plans indicating the nature and extent of the track protection shoring proposed.

Shoring shall be designed for Coopers E80 live load surcharge and the UPRR may impose more stringent requirements as conditions warrant.

For excavations which encroach into railroad live load surcharge zone, shoring plans will be accompanied by a copy of the design calculations, and both must be stamped by a registered professional engineer.

Design of shoring shall comply with UPRR guidelines for design and construction of shoring adjacent to active railroad tracks.

TRACK PROTECTION SHORING REQUIREMENTS



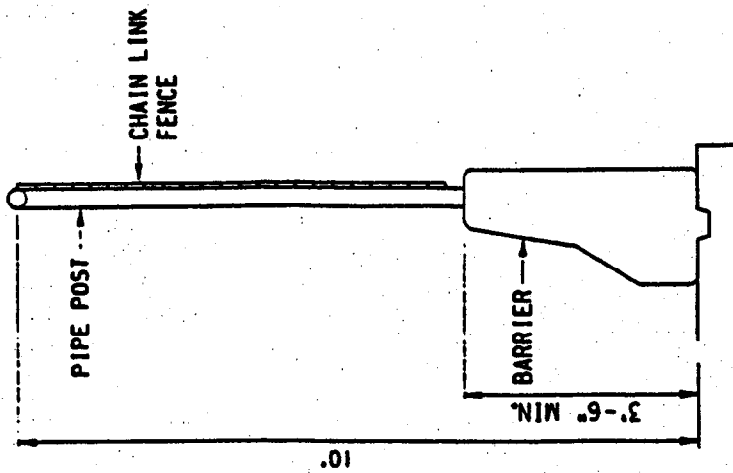
UNION PACIFIC RAILROAD

GENERAL SHORING REQUIREMENTS

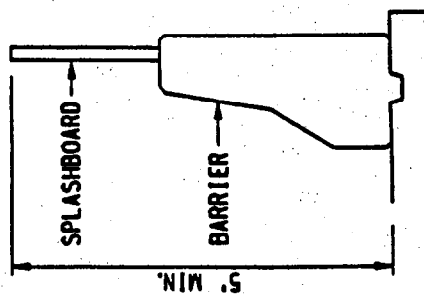
OFFICE OF CHIEF ENGINEER DESIGN

DATE: 3-31-98 REDRAWN

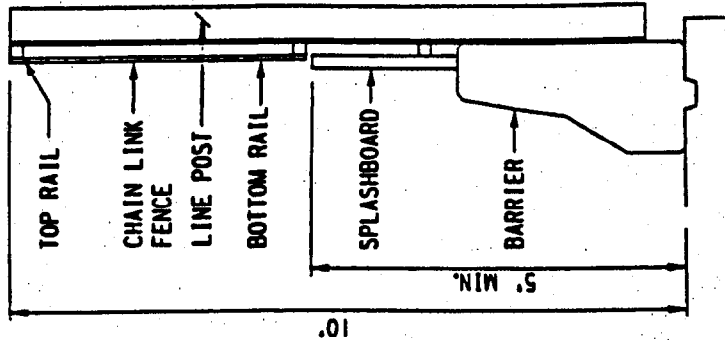
C.E. 106613



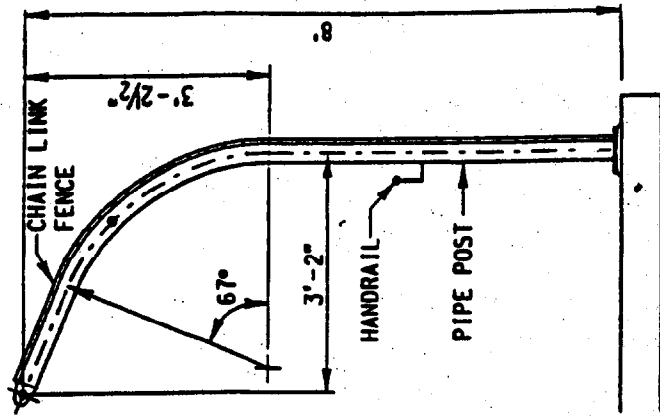
**BARRIER WITH
FENCE**
NO SCALE



**BARRIER WITH
SPLASHBOARD**
NO SCALE



**BARRIER WITH
SPLASHBOARD
AND FENCE**
NO SCALE



**FENCE FOR
WALKWAYS**
NO SCALE



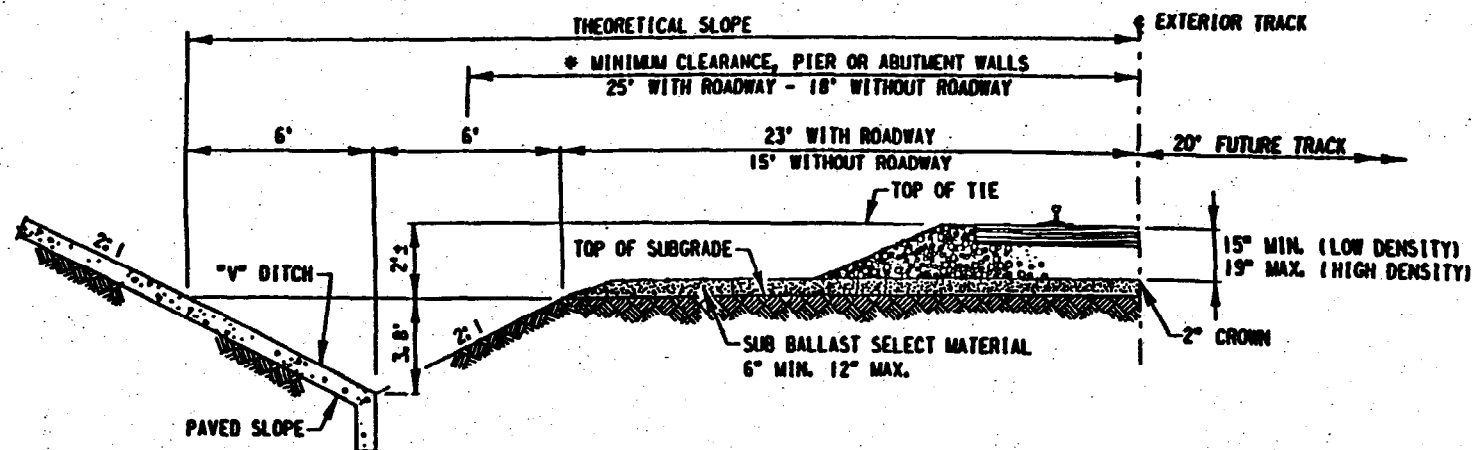
UNION PACIFIC RAILROAD

BARRIERS, FENCES, & SPLASHBOARDS TO BE PROVIDED
AT HIGHWAY, STREET, AND PEDESTRIAN OVERPASSES

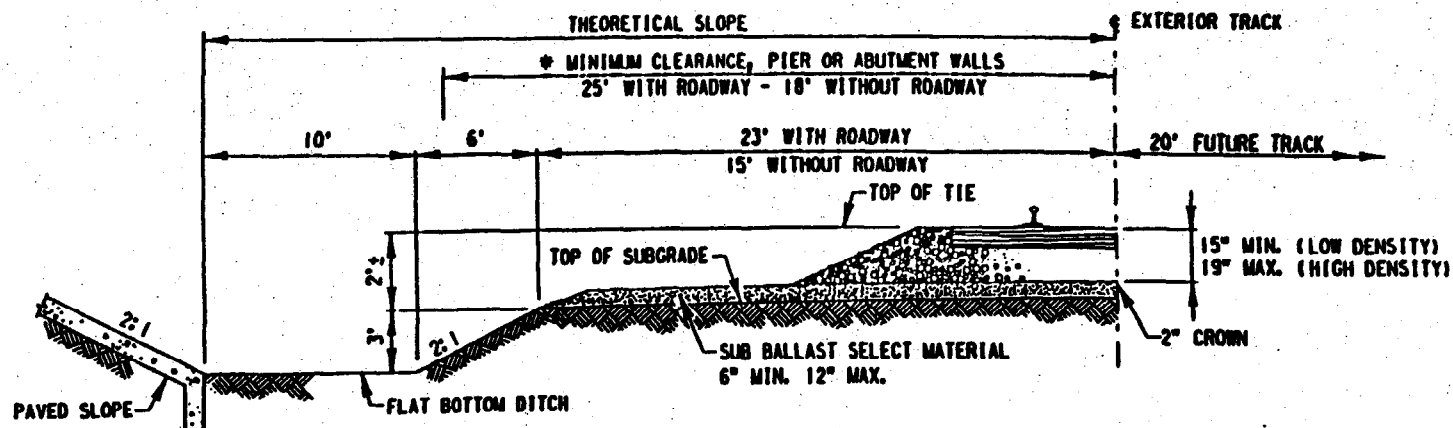
OFFICE OF CHIEF ENGINEER DESIGN

DATE: 3-31-98

DRAWING UP-OHI



TYP. SECTION AT ABUTMENT SLOPES WITH STD. "V" DITCH



TYP. SECTION AT ABUTMENT SLOPES WITH STD. FLAT BOTTOM DITCH

NOTE: MINIMUM DITCH SIZES ARE SHOWN. DITCH SIZE TO BE INCREASED AS REQUIRED BY LOCAL CONDITIONS BASED ON HYDRAULIC STUDIES.

* LOCATION OF PIER, BENT COLUMNS OR ABUTMENT WALLS SHOULD NOT INTERFERE WITH THE DRAINAGE IN THE AREA. IF MINIMUM STANDARD DITCHES ARE NOT PROVIDED IN THE LAYOUT, LONGITUDINAL CULVERTS SHOULD BE SHOWN THAT WILL HANDLE THE DRAINAGE AS REQUIRED BY THE HYDRAULIC STUDIES.



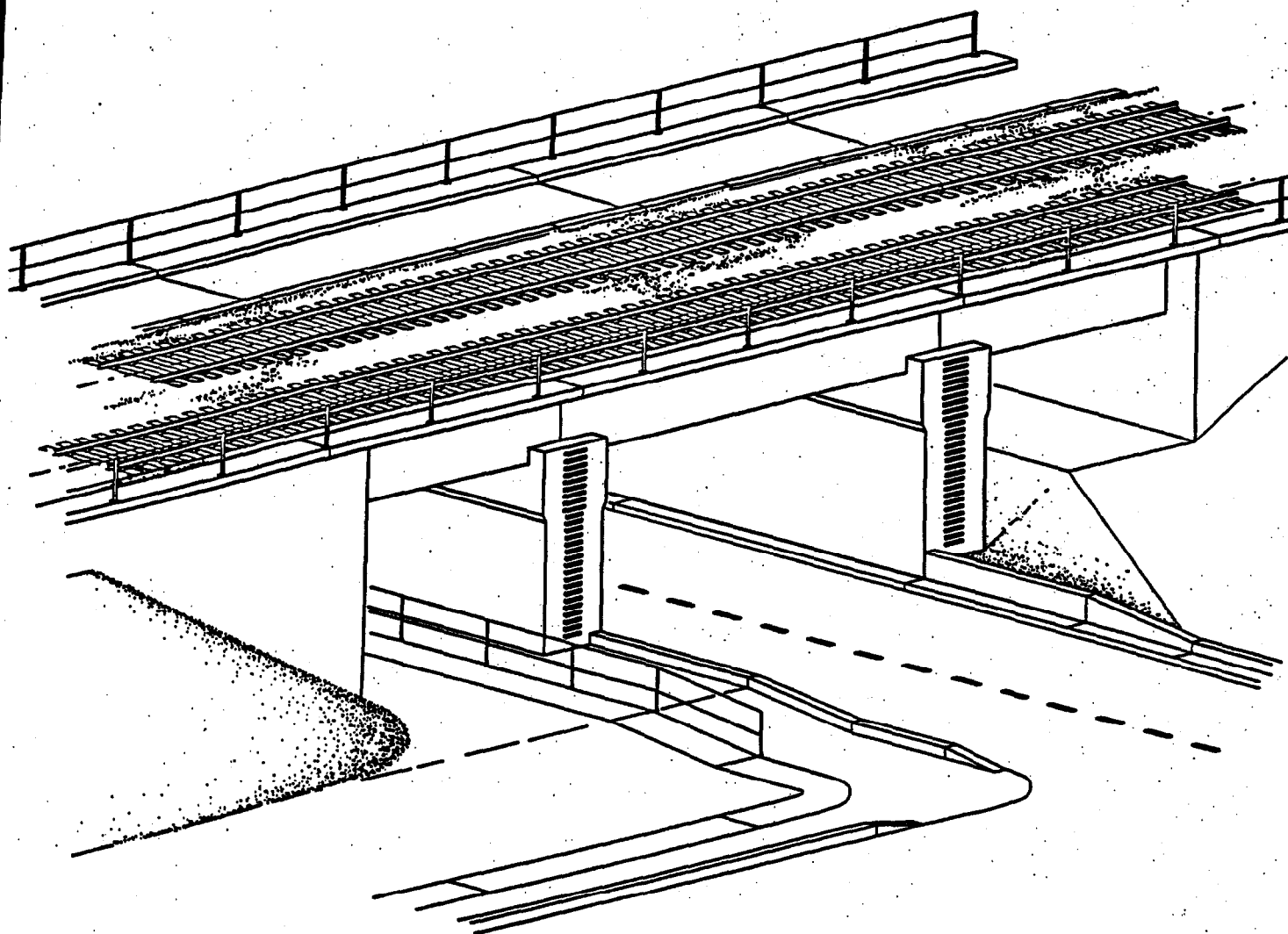
UNION PACIFIC RAILROAD

**TYPICAL SECTIONS AT ABUTMENT SLOPE
OFFICE OF CHIEF ENGINEER DESIGN**

DATE: 3-31-98

DRAWING UP-OH2

GUIDELINES FOR DESIGN AND CONSTRUCTION OF GRADE SEPARATION UNDERPASS STRUCTURES



UNION PACIFIC RAILROAD

OFFICE OF CHIEF ENGINEER DESIGN
1416 DODGE ST.
OMAHA, NE 68179

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UNION PACIFIC RAILROAD COMPANY

UNDERPASS GRADE SEPARATION STRUCTURES

I PURPOSE AND SCOPE

The intent of this guideline is to inform public agencies, design engineers and contractors of Union Pacific Railroad Company's current standards and requirements concerning design and construction of grade separation underpass structures.

Continuity of safe rail operations shall be required for the duration of the project and construction work shall in no way impede the train operations of the Union Pacific Railroad.

The specific requirements addressed in this document should be followed for structures on which the Union Pacific Railroad operates regardless of whether it is maintained by Union Pacific Railroad. Compliance with these requirements will help to expedite the completion of design and construction reviews.

Designs of all public works projects shall be prepared either by the engineering staff of that agency or a consulting engineer who has been approved by both Union Pacific Railroad Company and that public agency.

Selection of consultants shall be limited to those who are familiar with the design of railroad bridges, and particularly with the special requirements and operating conditions of the Union Pacific Railroad Company.

Public Agency or their representative shall provide information requested on attached data sheet to the Manager of Industry and Public Projects of the district that project is located in the preliminary stages of the project. See Data Sheet, Appendix A.

This guideline supplements the applicable sections of the American Railway Engineering Association (AREA) Manual of Recommended Practice in connection with the design of ballast deck railway bridges.

II STRUCTURE SELECTION CRITERIA

1. Grade separation underpass structures shall be ballast deck type structures. Open deck type structures shall not be used as permanent structures. Open deck type structures can be used only for temporary structures built in

conjunction with shoofly construction.

2. When possible, simple span structures should be used.
3. Continuous span, deck or through truss type structures are to be avoided.
4. Trough type post-tensioned simple or continuous structures are not acceptable.
5. Grade separation structures may require inside guard rail. Refer to Union Pacific Railroad Company standard drawing 4005 (Double Inside Guard Rail for Timber Ties) or 4015 (Double Inside Guard Rail for Concrete Ties) for details and requirements. See Appendix A.

III LIST OF PREFERABLE UNDERPASS STRUCTURES

Following is a list of underpass structures preferable to Union Pacific Railroad Company in priority order. The Union Pacific Railroad Company will require the most preferred alternative in all cases, unless the agency can provide sufficient reasons for proposing a less preferred alternative.

1. Steel plate girders with cast-in-place concrete deck. See drawing **UP1**, Appendix A.
2. Rolled beams with cast-in-place concrete deck. See drawing **UP2**, Appendix A.
3. Prestressed concrete box girders single or double cell. See drawing **UP3**, Appendix A.
4. Prestressed concrete "AASHTO" type girders with cast-in-place concrete deck. See drawing **UP4**, Appendix A.
5. Cast-in-place concrete box girders conventional reinforced. See drawing **UP5**, Appendix A.
6. Post-tensioned concrete box girders. See drawing **UP6**, Appendix A.
7. Through type simple supported steel girder spans with concrete or steel deck will be considered by the office of the Chief Engineer when conditions preclude any other solution. See drawing **UP7**, or **UP8**, Appendix A.

8. Grade separation underpass structures of deck or through truss design are not preferable. However, in unusual circumstances, they will be considered by the office of the Chief Engineer Design if conditions preclude the use of any other type of structure.

IV ACCESS TO UNDERPASS STRUCTURE

For all grade separation underpass structures, an access roadway or bridge maintenance structure shall be provided for Union Pacific Railroad Company off-track maintenance equipment.

Access roadway with a turnaround shall be designed and constructed in conjunction with the grade separation bridge structure. Turnaround pad shall start no further than 30 ft. from the end of bridge structure and with embankment shoulder 60 ft. minimum from centerline of track. Roadway grade should not exceed 10% and shall terminate at the sub ballast elevation. Roadway shall have sufficient width to provide for one 12 ft. wide road, drain ditch and shoulder. Roadway and turnaround shall be constructed on compacted material and have a 12 inch thick minimum base and 6 inch thick A.C. pavement. Turnaround pad and roadway shall be sloped to drain away from track subgrade and dispose water to drainage system or existing right-of-way ditches. All down slopes of turnaround pad and roadway shall be protected with A.C. curbs to prevent embankment erosion.

Bridge maintenance structure may be part of the railway supporting structure or a completely separate structure. If bridge maintenance structure is part of the main railway structure, the structure shall be designed for E-80 load to accommodate any future track needs or modifications. If bridge maintenance structure is a totally separate structure it shall be designed for HS20-44 live load. The bridge maintenance width shall accommodate one 12 ft. paved lane with curbs and railing. Deck of bridge structure shall be concrete with 6 inches thick A.C. pavement. Bridge deck shall provide curbs, railing, drainage, and joint seals as required. Pavement of deck shall extend 20 ft. past the end of the structure and be placed over a 12 inch thick minimum base.

Access roadway with turnaround or bridge maintenance structure shall be shown in the preliminary plans and complete design shall be included in all subsequent submittals.

V SPECIFICATIONS

A. Design Specifications:

Underpass grade separation structures shall be designed and constructed in accordance with the most current edition of the American Railway Engineering Association (AREA) Manual of Recommended Practice.

Separate bridge maintenance structure shall be designed and constructed in accordance with the current edition of the American Association of State Highway and Transportation Officials (AASHTO) standard specifications for highway bridges.

B. Construction Specifications:

Technical specifications for bridge construction shall comply with following:

1. AREA Specifications for Fabrication and Erection of Structural Steel (Chapter 15).
2. AREA Specifications for Concrete Structures and Foundations (Chapter 8)
3. AREA Specifications for Waterproofing (Chapter 29).
4. The Standard Specifications of the State's Highway Department or local agency responsible for the design and construction of highway bridges.
5. Standard Specifications of Public Works Department.
6. American Association of State Transportation and Highway Officials (AASHTO).

VI UNITS

Grade separation underpass projects that require the use of metric units shall indicate all controlling dimensions, elevations, design criteria assumptions, and material stresses in dual units. English units to be in parenthesis. Controlling dimensions refer to length of structure, span length, thickness of all deck elements. Controlling elevations refer to top of rail, rail profile, bridge seats, and footings. Design criteria or assumptions refer to live load, design speed etc.

VII BRIDGE LAYOUT

The following items shall be considered and adequately addressed in the layout of the grade separation underpass structure:

1. Layout of underpass structures shall indicate the limits of the Railroad right-of-way, exact locations of all existing overhead or underground utilities, pipeline locations, fiber optic locations, proposed drainage, proposed construction sequences including layout details for any temporary bridge structure such as shooflys etc. All construction must be scheduled to minimize the amount of track interference during construction.
2. **No** utility attachments will be permitted on the new structure. Existing or future fiber optic lines shall be placed underground and away from bridge structure. Refer to current Union Pacific Railroad Fiber Optic Rules Construction and Engineering Standards Manual or call 1-800-336-9193. Relocation of any existing utilities must be performed by the owners of said utility.
3. Minimum longitudinal grade of 0.2% on structure shall be provided for drainage purposes. Designer may provide drainage toward one end of structure or, when structure length is excessive, provide adequate deck grades to drain the structure to both ends. If the top of rail grades remain constant over the length of structure the depth of ballast may be varied but should be taken into account in the design.
4. For bridges located within a curve, the girders, abutments and piers shall be located with reference to chords.
5. Vandal fencing shall be provided on all underpass structures in urban areas and on underpass structures in rural areas where pedestrian traffic patterns, past history of vandalism, or other conditions near the project site may warrant.
6. Sloping embankments in front of abutments shall be paved.
7. The distance from the centerline of bridge to the nearest railroad milepost shall be shown on the plans.
8. Structures having multiple tracks shall be designed to accommodate any future shifting or relocation of track. Longitudinal members are to be evenly spaced, with no less than two support members per rail.

9. Cantilever type abutment stems shall be at least 0.2H in thickness at the base.
10. Columns shall be at least 0.2H in thickness at the base.
11. Floor beams shall be a minimum of 21 inches in depth.
12. The year of construction shall be shown at the face of backwall. Numbers shall be embedded into the concrete and be 6 inch size.

VIII SKEW OF BRIDGE

The preferred angle of roadway crossing and bridge structure relative to the centerline of track is 90°. However, in cases where a 90° crossing cannot be obtained, the maximum skew of bridge structure from 90° shall not exceed the following for various types of structures:

TYPE OF STRUCTURE	SKEW IN DEGREES
Steel spans with concrete deck (Beams, Deck Girders, Through Girders)	30° MAX.
Prestressed concrete with concrete deck (AASHTO beams)	30° MAX.
Prestressed concrete box girders	15° MAX.
Cast-in-place box girders conventionally reinforced or Post-tensioned	20° MAX.
Trough type prestressed girders	15° MAX.

Align roadway, bridge piers, and abutments as required to comply with the above maximum skew limitations.

Transverse tie rods in end blocks and interior diaphragms should be in the direction of skew. Multiple prestressed concrete girders shall be bonded together with epoxy or grout. In addition, transverse tie rods shall be installed through the end blocks and interior diaphragms. See drawing UP9, Appendix A

Where conditions preclude any other solution, the skew proposal will require special structural consideration and proof of adequacy. Skews in excess of 15° are not permitted for continuous structures.

At the ends of a skewed bridge, support slabs shall be provided for each track. Ends of track slab shall be perpendicular to the centerline of the track and be 12 ft. minimum width placed symmetrically to the centerline of the track. Length of track slab shall be 12 ft. minimum beyond the back face of backwall.

IX VERTICAL CLEARANCES

Underpass structures shall be designed and provide sufficient vertical clearance and protective devices to ensure that structure will be protected from oversized and unauthorized high loads. Designers and public agencies shall comply with the following vertical clearances:

STRUCTURE OVER	STEEL	CONCRETE
Freeways	16.5 ft.	17.5 ft.
Designated arterial routes	16.5 ft.	17.5 ft.
Local roads and streets	15.5 ft.	16.0 ft.
Rural roads	15.0 ft.	15.5 ft.
Pedestrian under crossing (no vehicles)	8.0 ft.	8.0 ft.
Recreational roads	12.5 ft.	12.5 ft.

All concrete structures in above table except pedestrian under crossing without vehicular traffic shall be protected with collision impact devices installed over the full width of traveled lanes and attached to the bridge soffit. All structures with vertical clearances less than 17.5 ft. shall be protected with a steel sacrificial beam. Sacrificial beam shall be installed a minimum of 5 ft. ahead of the collision impact device or ahead of the main supporting member and shall not carry railway loads. Sacrificial beam shall be of steel shape (wide flange or tubing) and of sufficient strength to limit horizontal deflection to 6 inches caused from the impact from oversized vehicle or load. Additionally it shall be anchored sufficiently to bridge seat at an elevation of at least 6 inches below the bridge soffit. For more details see drawing UP16 Appendix A.

If resurfacing or any other activity is to be performed below the underpass structure, the owner of the roadway must submit a request for approval from Union Pacific Railroad Company. This request must provide the existing measured and posted clearances of the structure and the proposed configuration after work is completed.

The owner of the roadway shall be responsible of posting and maintaining structure sign clearances and any advance street notifications as required.

X DESIGN LOADS

1. Underpass bridge structures shall be designed for all loads specified in Chapters 8, 9, or 15 of the AREA Specifications.

The design of underpass structures shall comply with the seismic criteria of the current edition of AREA, Chapter 9 - Seismic Design for Railway Structures.

2. Live Load and Impact as specified in the AREA Specifications.
3. All underpass structures shall be designed for a maximum thirty (30) inches of ballast (top of deck to top of tie) to account for future track raises. Structures shall be constructed to the required grades with the minimum depth of ballast under the tie of eight (8) inches for timber, and twelve (12) inches for concrete.
4. Under normal working loads, composite action may be expected between a concrete deck and its supporting steel members, when shear transfer devices are used. The bottom of the deck slab shall be placed at least one inch below top of supporting steel members. For design purposes, the supporting steel members shall be proportioned to carry E65 live, impact, and dead loads without taking into account any composite action, and E80 live, impact, and dead loads taking into account composite action. Composite action may be taken into account when satisfying the deflection-length ratio requirement of Chapter 15, Article 1.2.5 of the AREA Specifications provided shear transfer devices are installed.
5. Live load distribution for precast prestressed single or double cell boxes shall be in accordance with Part 2, Reinforced Concrete Design, Article 2.2.3.c.(1) of the AREA specifications. Live load shall not be assumed to be distributed to the number of boxes supporting the tracks.

For multiple track structures, live load shall be distributed based on the assumption of the track being in any location.